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S/020/60/135/006/006/037
C 111/ C 333

Asymptotic Expansions of Solutions to Ordinary Linear Differential Equations Having Small Coefficients With Their Higher Derivatives in the Neighborhood of an Irregular Singular Point

$$\lim_{\varrho \to 0} \Psi_k(\varrho, \delta_0) = \Psi_k(\delta_0) = \begin{cases} \Psi_k^0 & \text{if } 2 \leqq k \leqq m \\ \Psi_k^0 - \delta_0 & \text{if } m+1 \leqq k \leqq n \end{cases}$$

Let $\Psi_0 \leqq \Psi_k(\delta_0) \leqq \Psi_0 + 2\pi$. Let

(13) 1.) $z \in G_k(\varrho, \delta_0)$ if $-2/3\pi - \Psi_k(\varrho, \delta_0) < \arg z < 2/3\pi - \Psi_k(\varrho, \delta_0)$

2.) $z \in G_k(\delta_0)$, if $-2/3\pi - \Psi_k(\delta_0) < \arg z < 2/3\pi - \Psi_k(\delta_0)$

Card 4/8

87392

S/020/60/135/006/006/037
C 111/ C 333

Asymptotic Expansions of Solutions to Ordinary Linear Differential Equations Having Small Coefficients With Their Higher Derivatives in the Neighborhood of an Irregular Singular Point

3.) $z \in G_k^o$, if $-2/3\pi - \psi_k^o < \arg z < 2/3\pi - \psi_k^o$.

Let G_o be the intersection of the G_k^o; $G(\delta_o)$ intersection of the $G_k(\delta_o)$; $G(\varsigma, \delta_o)$ intersection of the $G_k(\varrho, \delta_o)$. Let $G_\alpha(\delta_o)$ be narrower than $G(\delta_o)$ and let it be contained in $G(\varrho, \delta_o)$ for all sufficiently small ϱ. By the transformation

(14) $W(z, \varepsilon) = e^{\lambda_1(\varepsilon)z} z^{\sigma_1(\varepsilon)} u(z, \varepsilon)$

let (1) pass over into

(15) $L[u; \varepsilon] = \sum_{k=m+1}^{n} \varepsilon^{k-m} p_k(z, \varepsilon) u^{(k)} + \sum_{k=0}^{m} p_k(z, \varepsilon) u^{(k)} = 0,$

where

$p_n(z, \varepsilon) = 1, \; p_k(z, \varepsilon) = \sum_{s=0}^{\infty} \varepsilon^s a_{k,s}(z) = \sum_{s=0}^{\infty} z^{-s} b_{k,s}(\varepsilon).$

Card 5/8

87392

S/020/60/135/006/006/037
C 111/ C 333

Asymptotic Expansions of Solutions to Ordinary Linear Differential Equations Having Small Coefficients With Their Higher Derivatives in the Neighborhood of an Irregular Singular Point

Let $L[u,\varepsilon]$ be represented as

$$(23)\quad \bar{L}[u,\varepsilon] = \sum_{s=0}^{\infty} \varepsilon^{s} \bar{L}_{s}[u],$$

where

$$\bar{L}_0[u] = u^{(m)} + \sum_{k=0}^{m-1} a_{k,0}(z)\, u^{(k)},\quad \bar{L}_s[u] = \sum_{k=m+1}^{n} a_{k,s-k+m}(z) u^{(k)} +$$

$$+ \sum_{k=0}^{m-1} a_{k,s}(z)\, u^{(k)},$$ where $a_{k,s} = 0$ for $s < 0$.

Theorem: Let $u(z,\varepsilon)$ be the solution of (15) and have the asymptotic expansion

$$(28)\quad u(z,\varepsilon) \simeq 1 + \sum_{s=1}^{\infty} c_{1,s}(\varepsilon)\, z^{-s} \text{ in } G_{\alpha}(\delta_0) .$$

Card 6/8

87392

S/020/60/135/006/006/037
C 111/ C 333

Asymptotic Expansions of Solutions to Ordinary Linear Differential Equations Having Small Coefficients With Their Higher Derivatives in the Neighborhood of an Irregular Singular Point

Assume that the function $u_0(z)$ satisfies

(25) $\bar{L}\left[u_0\right] = 0$

and has the asymptotic expansion

(27) $u_0(z) \simeq U_1(z) = 1 + \sum_{s=1}^{\infty} c_{1,s}^{0} z^{-s}$ in G_0,

while the functions $u_s(z)$ are determined by the equations

(26) $\bar{L}_0\left[u_s\right] = - \sum_{\mu=0}^{s-1} \bar{\bar{L}}_{\mu}\left[u_{s-1-\mu}\right]$

as well as by the condition that they decrease at infinity as $1/z$ in G_0. Then the formal expansion of $u(z, \varepsilon)$ in terms of ε -powers

Card 7/ 8

87392

S/020/60/135/006/006/037
C 111/ C 333

Asymptotic Expansions of Solutions to Ordinary Linear Differential Equations Having Small Coefficients With Their Higher Derivatives in the Neighborhood of an Irregular Singular Point

$$U(z, \varepsilon) = \sum_{s=0}^{\infty} \varepsilon^{s} u_{s}(z) \tag{24}$$

is asymptotic in $G_{\alpha}(\delta_0)$ for $\varepsilon \to 0$ ($\arg \varepsilon = \delta_0$) so that

$$\lim_{\varepsilon \to 0} u(z, \varepsilon) = u_c(z) .$$

The author thanks Yu. L. Rabinovich and D. P. Kostomarov for assistance.

There are 6 references: 5 Soviet and 1 Belgian.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M. V. Lomonosova (Moscow State University imeni M. V. Lomonosov)

PRESENTED: July 7, 1960, by J. G. Petrovskiy, Academician

SUBMITTED: July 7, 1960

Card 8/8

APPROVED FOR RELEASE: 09/17/2001 CIA-RDP86-00513R000721810002-0"

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S/140/61/000/005/007/007
C111/C222

AUTHOR: Khapayev, M. M.

TITLE: The asymptotic development of hypergeometric and degenerated hypergeometric functions

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy. Matematika, no. 5, 1961, 98-101

TEXT: The author obtains asymptotic developments of the hypergeometric function $F(a,b,c,z)$ and the degenerated hypergeometric function $F(a,c,z)$ for the case that a and c are large and have the same order. The author starts from the equations

$$z\frac{d^2u}{dz^2} - (z-c)\frac{du}{dz} - au = 0 \qquad (1)$$

and

$$z(1-z)\frac{d^2u}{dz^2} + \left[c - (a+b+1)z\right]\frac{du}{dz} - abu = 0 \qquad (13)$$

respectively, where $a = \alpha l$, $c = \gamma l$, l -- large, $\alpha \neq 0$, $\gamma \neq 0$, he

Card 1/4

28811

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C111/C222

The asymptotic development . . .

introduces the new variable $t = \frac{\alpha}{\gamma} z$ and obtains equations with a small parameter for the highest derivative, e. g. (1) changes in

$$\varepsilon t v'' + [\varepsilon t(d+1) + \gamma] v' + \varepsilon t d v = 0 \qquad (2)$$

with $v(t) = e^{-t} u\left(\frac{\gamma}{\alpha} t\right)$; $d = 1 - \frac{\gamma}{\alpha}$; $\varepsilon = \frac{1}{1}$. The asymptotic development of the solution of (2) regular in 0 corresponds to F(a, c, z).
Thus the author obtains the developments

$$F(\alpha 1, \gamma 1, z) \simeq e^{\frac{\alpha}{\gamma} z} \left\{ 1 + \frac{1}{1} \frac{\left(\frac{\alpha}{\gamma}\right)^2}{2} \left(\frac{1}{\alpha} - \frac{1}{\gamma}\right) + \frac{1}{1^2} (\ldots) + \ldots \right\}$$

and

$$F(a,b,c,z) = u(t) \simeq \qquad \}. \ (17)$$

Card 2/4

28811

S/140/61/000/005/007/007
C111/C222

The asymptotic development . . .

$$\simeq (1-t)^{-b} \left\{ 1 + \varepsilon \frac{b(b+1)}{2} \left(\frac{1}{\gamma} - \frac{1}{\alpha} \right) \frac{1-2t}{(1-t)^2} + \varepsilon^2(\ldots) + \ldots \right\}. \quad (17)$$

For large m,n and $\left| \frac{m-n}{m+n} \right| \ll 1$ from (17) it follows a new asymptotic development for the adjoint Legendre functions:

$$P_n^m(x) = \frac{\Gamma(m+n)}{2^m \Gamma(m) \Gamma(n-m)} (x^2-1)^{\frac{m}{2}} F\left(m-n; n+m+1; m+1; \frac{1-x}{2}\right) \approx$$

$$\approx \frac{\Gamma(m+n)}{2^m \Gamma(m) \Gamma(n-m)} (x^2-1)^{\frac{m}{2}} \left(1 - \frac{n+m+1}{m+1} \frac{1-x}{2}\right)^{n-m} \times$$

$$\times \left\{ 1 + \frac{(m-n)(m-n+1)n}{2(m+1)(m+n+1)} \cdot \frac{1 - \frac{n+m+1}{m+1}(1-x)}{\left(1 - \frac{n+m+1}{m+1} \frac{1-x}{2}\right)^2} + \ldots \right\}.$$

Card 3/4

28811

S/140/61/000/005/007/007
C111/C222

The asymptotic development . . .

The author thanks Yu. L. Rabinovich for the attention for the paper. There are 2 Soviet-bloc and 1 non-Soviet-bloc references.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet imeni M. V. Lomonosova (Moscow State University imeni M.V.Lomonosov)

SUBMITTED: March 28, 1959

Card 4/4

S/042/61/016/004/004/005
C111/C444

AUTHOR: Khapayev, M. M.

TITLE: Linear differential equations with small coefficients at some of the highest order derivatives in the neighborhood of an inessential singular point

PERIODICAL: Uspekhi matematicheskikh nauk, v. 16, no. 4, 1961, 187-194

TEXT: The following equation is considered

$$\mathcal{L}[u] = \sum_{k=1}^{\mu} \varepsilon^k z^{m+k} \bar{p}_{m+k}(z, \varepsilon) \frac{d^{m+k}u}{dz^{m+k}} + \sum_{h=0}^{m} z^h \bar{p}_h(z, \varepsilon) \frac{d^h u}{dz^h} = 0 \qquad (1)$$

where $\bar{p}_1(z,\varepsilon)$ are analytic with z and ε in the neighborhood of the point (0,0), $\bar{p}_{m+\mu}(0,0) \neq 0$ and $\bar{p}_m(0,0) \neq 0$. The point $z = 0$ is an inessential singular point of (1). The coefficients $\varepsilon^k z^{m+k} \bar{p}_{m+k}(z,\varepsilon)$ have a zero of at least k^{th} order for $z = 0$ with respect to ε, if $1 \leq k \leq \mu - 1$, and a zero of k^{th} order, if $k = \mu$. The defining

Card 1/4

S/042/61/016/004/004/005
Linear differential equations with . . . C111/C444

equation for the characteristic exponents ϱ of the point $z = 0$ is

$$\sum_{k=1}^{\mu} \varrho(\varrho-1)\ldots(\varrho-m-k+1)\varepsilon^{k}\bar{p}_{m+k}(0,\varepsilon) +$$

$$+ \sum_{h=0}^{m} \varrho(\varrho-1)\ldots(\varrho-h+1)\,\bar{p}_{h}(0,\varepsilon) = 0 \qquad (2)$$

For $\varepsilon \to 0$ μ roots of (2) go to infinity and m roots pass continuously over into the roots of the defining equation

$$\sum_{h=0}^{m} \varrho(\varrho-1)\ldots(\varrho-h+1)\,\bar{p}_{h}(0,0) = 0 \qquad (3)$$

of the degenerate differential equation. Let ϱ_1 be a simple root of (3) and $\varrho_1(\varepsilon)$ be a root of (2), where $\varrho_1(0) = \varrho_1$ and (2) do not possess any roots $\varrho_1(\varepsilon) + l$, $l > 0$ being an integer.

If one puts $u(z,\varepsilon) = z^{\varrho_1(\varepsilon)}\,w(z,\varepsilon)$, then $w(z,\varepsilon)$ satisfies the equation

Card 2/4

S/042/61/016/004/004/005
Linear differential equations with . . . C111/C444

$$\mathcal{L}[w] = \sum_{k=1}^{\mu} \varepsilon^k z^{m+k-1} p_{m+k}(z,\varepsilon) w^{(m+k)} + \sum_{h=1}^{m} z^{h-1} p_h(z,\varepsilon) w^{(h)} + p_0(z,\varepsilon) w = 0 \quad (5)$$

This equation possesses a regular solution for $z = 0$ which can be searched formally in the form

$$\overline{w}(z,\varepsilon) = \sum_{i=0}^{\infty} \varepsilon^i w_i(z) \qquad (9)$$

$w_i(z)$ are determined by recurrent relations after putting (9) in (5) and by the initial conditions

$$w_0(0) = 1, \ w_{h+1}(0) = 0 \quad (h = 0,1,2,\dots) . \qquad (11)$$

The author proves that the formal expansion (9) is the asymptotic expansion of the regular solution of (5) in a domain G. The domain G consists of the ε - plane, out of which certain angular domains are cut; z must satisfy the condition $|z| < R_2$ where a certain upper

Card 3/4

S/042/61/016/004/004/005
Linear differential equations with . . . C111/C444

bound is given for R_2.

A. N. Tikhonov, A. B. Vasil'yeva, J. S. Gradshteyn are mentioned; the author thanks Yu. L. Rabinovich for useful advices.

There are 4 Soviet-bloc references and 1 non-Soviet-bloc reference.

SUBMITTED: August 17, 1959

Card 4/4

S/039/62/057/002/002/003
B172/B112

AUTHOR: Khapayev, M. M. (Moscow)

TITLE: Asymptotic expansions in the neighborhood of an irregular pole of solutions of ordinary linear differential equations with small coefficient in the higher derivatives

PERIODICAL: Matematicheskiy sbornik, v. 57(99), no. 2, 1962, 187-200

TEXT: An equation

$$\sum_{k=m+1}^{n} \varepsilon^{k-m} \bar{p}_k(z,\varepsilon) w^{(k)} + \sum_{k=0}^{m} \bar{p}_k(z,\varepsilon) w^{(k)} = 0 .$$

with $p_n(z,\varepsilon) = 1$, $\lim p_m(z,0) \neq 0$ is considered. The coefficients p_k are assumed to be analytic in the neighborhood of $\varepsilon = 0$, $z = \infty$. This point then is an irregular second-order pole. The formal solutions of the differential equation can be constructed as normal series. For each formal solution, a complete neighborhood of the point, at infinite distance, can be decomposed into a series of angular domains in such a way that, for

Card 1/2

KHAPAYEV, M.M. (Moskva)

Asymptotic behavior near an irregular singular point of solutions of ordinary linear differential equations with small coefficients at the higher derivatives. Mat. sbor. 57 no.2: 187-200 Je '62. (MIRA 15:6)
(Differential equations, Linear)

L 45557-65 EWT(m)/T/EWA(m)-2
ACCESSION NR: AP5009831 UR/0367/65/001/002/0274/0276

AUTHOR: Khapaev, M. M.

TITLE: On the stability of motion of a charged particle in a magnetic field

SOURCE: Yadernaya fizika, v. 1, no. 2, 1965, 274-276

TOPIC TAGS: helical field, charged particle motion, magnetic focusing, strong focusing system, betatron oscillation, adiabatic invariant, particle accelerator

ABSTRACT: The general averaging methods developed by N. N. Bogolyubov and Yu. A. Mitropol'skiy (Asimptoticheskiye metody v teorii nelineynykh kolebaniy [Asymptotic Methods in the Theory of Nonlinear Oscillations], Fizmatgiz, 1963) and by V. M. Volosov (UMN v. 17, 3, 1962) are used to investigate the motion of a charged particle in a straight helical field. Such an investigation is of interest in connection with strong focusing systems of magnetic lenses for high-energy particles. Adiabatic invariants of the averaged system are constructed and it is shown that the particle can be trapped in the vicinity of the helical-symmetry axis of the field. The resultant equations can be linearized for small betatron oscillations near an equilibrium position, and the frequency of the small oscillations can be

Card 1/2

L 45657-65
ACCESSION NR: AP5009831

determined. The results show that the averaged trajectories and the solution of the system remain close to one another over a finite number of slow cycles. Orig. art. has: 6 formulas.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet (Moscow State University).

SUBMITTED: 25Jun64 ENCL: 00 SUB CODE: MP

NR REF SOV: 003 OTHER: 000

mel
Card 2/2

L 63004-65 EWT(m)/EPA(w)-2/EWA(m)-2 Pt-7 IJP(c)
ACCESSION NR: AP5016627 UR/0188/65/000/003/0057/0063
530.12:531.51

AUTHOR: Ktapayev, M. M. (Member of mathematics dept)

TITLE: On focusing of beams of high speed charged particles in stellerator type fields

SOURCE: Moscow. Universitet. Vestnik. Seriya 3. Fizika, astronomiya, no. 3, 1965, 57-63

TOPIC TAGS: charged particle, magnetic field, particle trajectory, high energy accelerator, trajectory equation

ABSTRACT: The focusing properties of a high energy beam of charged particles were studied analytically in a helical magnetic field. The components of the magnetic field are given by

$$H_r = H_0\left(\frac{r}{r_0}\right)^{m-1}\sin m(\varphi - \alpha z),$$

$$H_\varphi = H_0\left(\frac{r}{r_0}\right)^{m-1}\cos m(\varphi - \alpha z),$$

$$H_z = -H_0\left(\frac{r}{r_0}\right)^{m}\alpha\cos m(\varphi - \alpha z),$$

Card 1/5

L 63004-65

ACCESSION NR: AP5016627

and the particle trajectory equations are written in cylindrical coordinates r, φ, z, under the assumption that $v_\perp / v \ll 1$. Two more equations are given of the type

$$\ddot{r} - r\dot{\varphi}^2 = \frac{ev}{cm} \cdot \frac{H_0}{r_0^{m-1}} (-1) r^{m-1} \cos m(\varphi - \omega t),$$

$$r\ddot{\varphi} + 2\dot{r}\dot{\varphi} = \frac{ev}{cm} \cdot \frac{H_0}{r_0^{m-1}} \cdot r^{m-1} \sin m(\varphi - \omega t),$$

$$z = vt, \quad \omega = \alpha v,$$

called longitudinally unperturbed equations. It is further assumed that the frequency ω is very small or $\left|\frac{\dot{\varphi}}{\omega}\right| \ll 1$ and the following small quantity is introduced $\frac{1}{(m\omega)^2} \frac{f}{} = \varepsilon$, $v_\perp = \sqrt{\varepsilon} u$. The final form of the trajectory equations is then given by the set of equations

$$\dot{u} = -b\cos\theta,$$

$$\dot{\theta} = 1 + \frac{b}{u}\sin\theta + \varepsilon(m-1)\frac{u}{r}\sin(\theta - \psi),$$

$$\dot{\psi} = 1 + \varepsilon m \frac{u}{r} \sin(\theta - \psi),$$

$$\dot{r} = \varepsilon u \cos(\theta - \psi).$$

Card 2/3

L 63004-65

ACCESSION NR: AP5016627

where $\psi = m(\varphi + \omega t)$. The solution of these equations is obtained by means of a simplified degenerate system of equations with two adiabatic invariant integrals

$$p + 2a^2 r^{2(m-1)} = \text{constant} = \lambda,$$

$$(\lambda - b^2)^{m-1} b^2 \sin^{2(m-1)} \Phi = \gamma,$$

which describes a periodic motion for the average system. This in turn permits certain conclusions to be made about the focusing capabilities of such charged particle beams. It is shown that interactions between transverse motion and longitudinal motion in the beam are very small. The author expresses his gratitude to A. N. Tikhonov for his very valuable comments on the results. Orig. art. has: 25 equations.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet, Kafedra matematiki (Moscow State University, Department of Mathematics)

SUBMITTED: 15Apr64 ENCL: 00 SUB CODE: NP

NO REF SOV: 002 OTHER: 000

Card 3/3

L 5136-66 EWT(m)/EPA(w)-2/EWA(m)-2 IJP(c)

ACCESSION NR: AP5018745 UR/0020/65/163/002/0343/0346

AUTHOR: Khapayev, M. M.

TITLE: Nonlinear theory of the motion of fast charged particles in helical toroidal magnetic fields

SOURCE: AN SSSR. Doklady, v. 163, no. 2, 1965, 343-346

TOPIC TAGS: charged particle, particle acceleration, helical magnetic field, focusing accelerator

ABSTRACT: The author considers helical fields rolled into a torus whose central diameter R is much larger than the cross section diameter σ_0; the pitch L of the helical field is also assumed larger than σ_0. Such magnetic fields can be used for hard focusing of charged particles in accelerators and charged-particle guidance systems. An averaging method is used to construct adiabatic invariants, which describe nonlinear oscillations analogous to betatron oscillations. The equations describing these oscillations are linearized for small oscillation amplitudes, and formulas describing the main linear resonances of the system are obtained for their frequencies. The motion of the particle in such a field is considered both in the presence and in the absence of a turning field. Relations are obtained between the parameters of the system (R, L, σ_0) and the intensities of the helical and turning

Card 1/2

L 5136-66

ACCESSION NR: AP5018745

fields. Possible distortions of the system are discussed. This report was presented by M. A. Leontovich. Orig. art. has: 1 formulas.

ASSOCIATION: Moskovskiy gosudarstvennyy universitet im. M. V. Lomonosova (Moscow State University)

SUBMITTED: 22Dec64 ENCL: 00 SUB CODE: NP

NR REF SOV: 004 OTHER: 000

8C

Card 2/2

L 38430-66 EWT(1)/T IJP(c)

ACC NR: AP6025277 SOURCE CODE: UR/0188/66/000/003/0040/0046

AUTHOR: Khapayev, M. M.

ORG: Department of Mathematics, Moscow State University (Kafedra matematiki, Moskovskiy gosudarstvennyy universitet)

TITLE: Nonlinear motion theory of fast charged particles in helical toric magnetic fields

SOURCE: Moscow. Universitet. Vestnik. Seriya III. Fizika, astronomiya, no. 3, 1966, 40-46

TOPIC TAGS: ~~force field~~, ~~polar coordinate~~, ~~potential equation~~, Bessel function, harmonic oscillation, particle motion, fast particle, charged particle, helical magnetic field

ABSTRACT: Helical force fields are analyzed. These fields are bent into tori with a chosen radius R which is greater than the radius σ of the toric cross section. The motion in this field occurs on a helix whose pitch L is greater than the radius of the toric cross section. A particle moves in the toric field under the action of an upturning force and without it. The motion is analyzed by polar coordinates on the plane of the toric cross section. The potential equation is expressed by the toric parameters and the Bessel function of complex arguments which can be expanded into series. Equations for the components of the helical field with an upturning field were developed. A fast particle, moving along the axis of the helical field, can be considered to be under the action of a rapidly rotating force. This force causes

Card 1/2 UDC: 621.384.6.04

L 38430-66

ACC NR: AP6025277

a systematic drift of the particle. Introducing integral parameters as variable arguments, the particle motion can be analyzed on the cross-section plane of the torus. The particle moves slowly on a circumference on the cross-section plane, making two slight harmonic oscillations on the circumference. The same particle participates in the rapid motion of the field. Orig. art. has: 22 formulas. [EG]

SUB CODE: 20/ SUBM DATE: 15Dec64/ ORIG REF: 005/ ATD PRESS: 5043

Card 2/2

L 06324-67 EWT(d) IJP(c)
ACC NR: AP6017847 SOURCE CODE: UR/0376/66/002/005/0600/0608

AUTHOR: Khapayev, M. M.

ORG: Moscow State University im. M. V. Lomonosov (Moskovskiy gosudarstvennyy universitet)

TITLE: Method of averaging and several problems connected with averaging

SOURCE: Differentsial'nyye uravneniya, v. 2, no. 5, 1966, 600-608

TOPIC TAGS: ordinary differential equation, approximation method

ABSTRACT: A proof is given of N. N. Bogolyubov's averaging principle, which is based on the direct comparison of solutions of the input and averaged systems under general assumptions about the right-hand member. The object of study is systems of ordinary differential equations describing the motion of charged particles in special magnetic fields. For the system

$$\frac{dx}{dt} = \varepsilon X(t, x) \quad (1)$$

the following theorem is proved: Let a function $X(t,x)$ be defined for $t > 0$ and x belonging to a region D, and let the following conditions be fulfilled: a) $X(t,x)$ satisfies Karateodori's conditions, which assure the existence of a continuous solution $x(t)$; b) there exists a summable function $M(t)$ and a constant N_0 such that for $t \geq 0$

UDC: 517.934

L 06424-67
ACC NR: AP6017847

and $t \geq 0$ and $x \in D$ $|X(t, x)| \leq N(t)$, and for any finite interval $[t_1\ t_2]$ the following holds

$$\int_{t_1}^{t_2} N(t)\,dt \leq N_0(t_2 - t_1);$$

c) there exists a summable function $H(t)$ and a constant H_0, and also a non-vanishing function $\psi(\alpha)$, $\lim_{\alpha \to 0} \psi(\alpha) = 0$, such that for $t > 0$ and $x \in D$

$$|X(t, x') - X(t, x'')| < \psi(|x' - x''|)\,H(t), \quad \int_{t_1}^{t_2} H(t)\,dt \leq H_0(t_2 - t_1)$$

on any finite interval $[t_1\ t_2]$; d) there exists a limit in D uniform relative to x

$$\lim_{T \to \infty} \frac{1}{T} \int_0^T X(t, x)\,dt = X_0(x);$$

e) $X_0(x)$ in region D satisfies the Lipschitz condition

$$|X_0(x') - X_0(x'')| \leq \lambda |x' - x''|.$$

Then with any $\eta > 0$, however small, and with any large L one may associate a quantity ε_0 such that if $\xi = \xi(t)$ is a solution of the averaged system

$$\frac{d\xi}{dt} = \varepsilon X_0(\xi),$$

defined in the interval $0 < t < \infty$ and lying in region D along with its η-neighborhood,

Card 2/3

L 06334-67

ACC NR: AP6017847

3

then for $0 < \varepsilon < \varepsilon_0$ in the interval $0 < t < \frac{L}{\varepsilon}$ the following inequality holds

$$|x(t) - \xi(t)| < \eta,$$

in which $x(t)$ is a solution of system (1) coinciding with $\varepsilon(t)$ when $t = 0$. The author thanks A. N. Tikhonov, B. M. Budak, and V. M. Volosov for their useful comments. Orig. art. has: 45 formulas.

SUB CODE: 12/ SUBM DATE: 14Jun65/ ORIG REF: 010/ OTH REF: 002

Card 3/3 hkf

Card 1/2 UDC: 517.9:535.9

ACC NR: AT6034338

This, in turn, yields the characteristic equation for the cyclotron frequency ν. The particle motion is then analyzed for small values of the parameter ε, and it is shown that the adiabatic invariants λ and γ, given by

$$\rho^2(\eta + s_0) = \lambda, \quad \frac{\lambda^2}{\rho^2} + \rho^2\left(s_0^2 + \frac{1}{2} + \rho^2\right) = \gamma,$$

describe a slow, nonlinear oscillation for the particle motion. Orig. art. has: 22 equations.

SUB CODE: 20/ SUBM DATE: 28Jan65/ ORIG REF: 009

Card 2/2

AUTHOR: Khapayev, P.V., Engineer SOV-91-58-4-6/29

TITLE: On the Article of S.S. Gadzhiyev "On the Increase of the Number of Consumer Lines Connected with One Common Switch of 6 and 10 kv" (Po povodu stat'i S.S. Gadzhiyeva "Ob uvelichenii chisla potrebitel'skikh liniy, podklyuchayemykh pod odin vyklyuchatel' 6 i 10 kv")

PERIODICAL: Energetik, 1958, Nr 4, p 7, (USSR)

ABSTRACT: The author questions statement of S.S. Gadzhiyev that economy of an installation can be obtained by an increase of the number of consumer lines connected with one common switch of 6 and 10 kv. None of the circuits illustrating his article is justified by practical need. On the contrary, the reliability of the consumer's power supply is lowered.

1. Switching systems--Effectiveness

Card 1/1

KHAPAYEV, V.M., inzh.

Behavior of sodium sulfite as additive to boiler feed water.
Trudy RIIZHT no.46:4-27 '63. (MIRA 18:1)

KHAPAYEV, V.M., inzh.

Behavior of sodium sufite when used as an additive in boiler water. Teploenergetika 11 no. 1:49-52 Ja '64. (MIRA 17:5)

1. Rostovskiy institut inzhenerov zheleznodorozhnogo transporta.

KHAPAYEV, V.M., inzh.; KUBANOV, A.T., inzh.

Wash-off of silicic acid deposits in the sulfitation of boiler feedwater. Trudy RIIZHT no.46:28-35 '63. (MIRA 18:1)

KVAKIN, S.D., inzh.; KUBANOV, A.T., inzh.; KHAPAYEV, V.M., inzh.

Steam corrosion of steel used in the manufacture of boiler turbines in the presence of the products of decomposition of sodium sulfite. Trudy RIIZHT no.46:36-41 '63. (MIRA 18:1)

KHAPAYEVA, A.K., inzh.

Interuniversity conference devoted to the 22nd Congress of the CPSU. Izv. vys. ucheb. zav.; energ. 4 no.8:123-125 Ag '61. (MIRA 14:8)

1. Leningradskiy politekhnicheskiy institut im. M.I. Kalinina.

(Hydraulic engineering)
(Electric power plants)

KHAPAZHEV T. Sh.

USSR/Pharmacology, Toxicology - Narcotics. U-1

Abs Jour : Ref Zhur - Biol., No 3, 1958, 12845

Author : Shautsukova, L.K., Tkhashonov, N.I., Khapazhev, T.Sh., Khakulov, L.A., Dzohlayev, A.A.

Inst : -

Title : Certain Physiologic and Biochemical Changes in Rabbits During Amytal-Induced Sleep.

Orig Pub : Uch. Zap. Kabardinsk. gos. ped. in-t, 1956, vyp. 10, 113-126.

Abstract : Experiments were performed on male rabbits. A 15% solution of sodium amytal in a dose of 1.5-2 ml. was administered into the ear vein on 3 successive days. During the amytal-induced sleep, total plasma proteins decreased in proportion to the duration of the sleep. Blood sugar and iron decreased during the first two days but then began to increase until the sleep was terminated. During the amytal-induced sleep there was a decrease in Hb. and

Card 1/2

USSR/Pharmacology, Toxicology - Narcotics. U-1

Abs Jour : Ref Zhur - Biol., No 3, 1958, 12845

KHAPAZHEV, T.Sh.

Thresholds of the formation and the characteristics of local responses of the surface of the cerebral cortex evoked by direct electric stimulation under the influence of stimulants and narcotics. Vest. LGU 18 no.9:115-131 '63. (MIRA 16:6)
(STIMULANTS) (ELECTROENCEPHALOGRAPHY) (NARCOTICS)

KHAPAZHEV, T. Sh.

Effect of barbiturates on the excitability and electric activity of the cerebral cortex. Nerv. sist. no.4:135-139 '63 (MIRA 18:1)

1. Fiziologicheskiy institut Leningradskogo universiteta.

BARADULINA, Mariya Georgiyevna; KHAPERIYA, R.V., red.; PRONINA, N.D., tekhn. red.

[Clinical aspects and treatment of regional metastases in laryngeal cancer] Klinika i lechenie regional'nykh metastazov raka gortani. Moskva, Medgiz, 1963. 166 p. (MIRA 16:10)

(LARYNX--CANCER) (METASTASIS)

30963. KHAPILIN, A. G., MOISEYEV, S. G., AND SOKOLOVA, V. P.

Lechenie penitsillinom v klinike vnutrennikh bolezney. V sb: Voprosy ostroy vnutrenney kliniki. M., 1949, s. 247-58

21012
S/058/61/000/005/020/050
A001/A101

24.6600

AUTHORS: Morozova, P.V., Tleubergenova, G.A., Khapilin, V.N.

TITLE: Interaction of 660-Mev protons with nuclei of light and heavy elements of the photoemulsion

PERIODICAL: Referativnyy zhurnal. Fizika, no 5, 1961, 99-100, abstract 5B433 ("Uch. zap. Alma-Atinsk. gos. ped. in-t, 1958, (1959), v 12, no 2, 172-187)

TEXT: Stars produced by 660-Mev protons in nuclei of light (C,N and O) and heavy (Ag and Br) elements were studied with the aid of НИКФИ (NIKFI) photoemulsion. The total effective cross section was determined for inelastic interactions of protons with nuclei of the emulsion. Differential cross sections agree with that calculated on the basis of the optical nucleus model. Recoil protons formed in light nuclei possess higher energies than protons from heavy nuclei. The study of angular distribution of cascade particles has shown the preferential forward directional flux in light nuclei.

[Abstracter's note: Complete translation.]

Card 1/1

IL'IN, K.P., kand. tekhn. nauk; KHAPILOV, Yu.A., kand. tekhn. nauk;
SHESTAKOV, Yu.K., inzh.

Specialization of gondola cars is an efficient measure.
Zhel. dor. transp. 47 no. 11:22-26 N '65 (MIRA 19:1)

KHAPILOV, Yu. A.

"Choosing a Rational Method and the Fundamental Parameters of the Heating of a Railroad Car." Cand Tech Sci, Moscow Order of Lenin, and Labor Red Banner Inst of Railroad Transport Engineers imeni I. V. Stalin, Min Railways USSR, Moscow, 1954. (KL, No 1, Jan 55)

Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions. (13)
SO: Sum. No. 598, 29 Jul 55

KHAPILOV, Yu.A., kand. tekhn. nauk; TALALAY, V.I., inzh.

Design and calculation of the curve-in ability of coupled cars.
Vest. TSNII MPS 25 no.1:31-34 '66. (MIRA 19:2)

KHAPILOV, Yu., mladshiy nauchnyy sotrudnik; ZHURILOV, V., mladshiy nauchnyy sotrudnik

Use by foreign countries of plastics and synthetic materials in shipbuilding (from "Quarterly Transactions of the Institute of the Institute of Naval Architecture," no.3, July 1958). Mor.flot 19 no.8: 38-40 Ag '59. (MIRA 12:11)

1. Institut kompleksnykh transportnykh problem AN SSSR.
(Shipbuilding) (Plastics)

ACC NR: AP7003257 (N) SOURCE CODE: UR/0207/66/000/006/0096/0097

AUTHOR: Khapilova, N. S. (Novosibirsk)

ORG: none

TITLE: Axisymmetrical flow in a thin layer of fluid on the surface of a revolving body of revolution

SOURCE: Zhurnal prikladnoy mekhaniki i tekhnicheskoy fiziki, no. 6, 1966, 96-97

TOPIC TAGS: body of revolution, fluid flow, boundary flow, axisymmetric flow

ABSTRACT: This paper examines a problem earlier proposed by the author in which a system of equations was derived which describes flow in a fluid layer on the surface of a revolving body of revolution in a nonstationary system of coordinates associated with the body. Only axisymmetrical flow is studied. An analysis of theoretical data shows that in calculating nonsteady axisymmetric flow in a tube of finite length two boundary conditions must be given on the left and one on the right if the flow is "precritical," i.e., $v_1 < \sqrt{fh}$, or three boundary conditions on the left if flow is "supercritical," i.e., $v_1 > \sqrt{fh}$. When specifically choosing the boundary conditions in the case of steady axisymmetric flow it is of interest to study the possible forms of the free surface. The author introduces the concept of critical depth into the equations studied to determine the pre- or supercriticality of flow conditions. At

Card 1/2

ACC NR: AP7003257

greater than critical depths flow is such that depth continuously decreases; at less than critical depths flow is such that depth continuously increases. There are three forms of free surface in the first case and two in the second. Orig. art. has: 16 formulas.

SUB CODE: 20/ SUBM DATE: 06Aug65/ ORIG REF: 002

Card 2/2

VASILYEV, O.F.; KHAPILOVA, N.S. (Novosibirsk)

"An analysis of axisymmetric swirling inviscid flow in bounded regions"

report presented at the 2nd All-Union Congress on Theoretical and Applied Mechanics, Moscow, 29 January - 5 February 1964

Vasil'yev, O. F. (Novosibirsk

Prikladnoy mekhaniki i tekhn

differential equation, fluid mechanics, viscous fluid

The authors study nonsteady state flow of thin layer

a body of rotation, rotating

L 29047-66 EWT(1)/EWP(m)/EWT(m)/T IJP(c) DS/WW/DJ

ACC NR: AP6013205 SOURCE CODE: UR/0421/66/000/002/0102/0107

AUTHOR: Nikitin, A. K. (Rostov-na-Donu); Khapilova, V. S. (Rostov-na-Donu)

ORG: none

TITLE: The nonlinear problem of a spherical suspension

SOURCE: AN SSSR. Izvestiya. Mekhanika zhidkosti i gaza, no. 2, 1966, 102-107

TOPIC TAGS: nonlinear theory, viscous flow

ABSTRACT: The article treats the problem of the steady state motion of an incompressible viscous fluid between two concentric spheres. Into the gap between the spheres fluid is fed in through one opening, and through another opening it is withdrawn. The two concentric spheres are designated A_1 and A_2, and their radii as r_1 and r_2 ($r_1 < r_2$). In sphere A_2 there are two diametrically opposed openings: opening S_1, through which fluid is fed, and opening S_2, through which it is withdrawn. Assuming the motion of the fluid to be axisymmetric and neglecting mass forces, the equations of motion can be written as follows in a spherical system of coordinates:

Card 1/2

~~L 29849-66~~

ACC NR: AP6013205

$$
\begin{gathered}
\frac{\partial}{\partial r}\left(\frac{v_r^2+v_\theta^2}{2}\right)-\frac{D\psi}{r^2\sin^2\theta}\frac{\partial\psi}{\partial r}+\frac{1}{\rho}\frac{\partial p}{\partial r}=\frac{\nu}{r^2\sin^2\theta}\frac{\partial D\psi}{\partial\theta}\\
\frac{\partial}{\partial\theta}\left(\frac{v_r^2+v_\theta^2}{2}\right)-\frac{D\psi}{r^2\sin^2\theta}\frac{\partial\psi}{\partial\theta}+\frac{1}{\rho}\frac{\partial p}{\partial\theta}=-\frac{\nu}{\sin\theta}\frac{\partial D\psi}{\partial r}\\
\left(D=\frac{\partial^2}{\partial r^2}+\frac{\sin\theta}{r^2}\frac{\partial}{\partial\theta}\left(\frac{1}{\sin\theta}\frac{\partial}{\partial\theta}\right),\ v_r=\frac{1}{r^2\sin\theta}\frac{\partial\psi}{\partial\theta},\ v_\theta=-\frac{1}{r\sin\theta}\frac{\partial\psi}{\partial r}\right)
\end{gathered}
\qquad (1.1)
$$

Here D is the Stokes operator; ψ is the flow function; v_r, v_θ are components of the velocity. The article is devoted to a mathematical solution of the above problem. Orig. art. has: 11 formulas.

SUB CODE: 20/ SUBM DATE: 27Aug65/ ORIG REF: 003/ OTH REF: 001

Card 2/2

BENSMAN, V.M., kand. med. nauk (Krasnodar, ul. Gogolya, d.65, kv.1);

KHAPII, B.Kh.; MOISEYEV, V.S.

Concerning L.I.Shulutko's article "Posture defects and scoliosis." Ortop., travm. i protez. 26 no.12:78-79 D '65. (MIRA 19:1)

1. Iz kafedry gospital'noy khirurgii (zav. - doktor med.nauk B.N.Esperov) Kubanskogo meditsinskogo instituta i Krasnodarskiy krayevoy klinicheskoy bol'nitsy (glavnyy vrach - zasluzhennyy vrach RSFSR G.V.Novitskaya). Submitted June 3, 1965.

IHAPKINA, V.V.; PILATSKIY, P.O.

Automatic machine for assembling cardan axle crosspieces. Avt.prom. no.11:37-38 N '60. (MIRA 13:11)

1. Moskovskiy zavod malolitrazhnykh avtomobiley i Nauchno-issledovatel'skiy institut tekhnologii avtomobil'noy promyshelnnosti. (Machine-shop practice)

IVANOV, S.N.; KHAPKINA, Z.A.

Effect of various methods of introducing the superphosphate and humus mixture on the assimilation of phosphorus by corn. Dokl. AN BSSR 7 no.7:485-487 Jl '63. (MIRA 16:10)

1. Belorusskiy nauchno-issledovatel'skiy institut pochvovedeniya Ministerstva sel'skogo khozyaystva BSSR.

KHAPKINOV, A., agronom po zashchite rasteniy

Disinfecting and loading machine. Zashch. rast. ot vred. i bol. 9 no.9:25 '64. (MIRA 17:11)

KHAPKO, V. U.

Khapko, V. U.

"The Problem of Applying Hardening Processes to the Hub Portions of Railroad-Car Axles." Min Railways USSR. Moscow Order of Lenin and Order of Labor Red Banner Inst of Railroad Transport Engineers imeni I. V. Stalin. Moscow, 1955 (Dissertation for the degree of Candidate of Technical Sciences)

SO: Knizhnaya letopis' No. 27, 2 July 1955

KHAPKO, V.U.

ZOBNIN, N.P., doktor tekhn. nauk, prof.; ROGOV, A.Ya., kand. tekhn. nauk, dots.; KHAPKO, V.U., assistent.

Strengthening wheel pair axles by rolling. Trudy MIIT no.93:3-72 '57. (MIRA 11:4)

(Car axles) (Rolling (Metalwork))

ZOBNIN, N.P., doktor tekhn. nauk, prof.; KHAPKO, V.U., kand. tekhn. nauk, dotsent

Hardening treatment of axles after prolonged operation. Trudy MIIT no.159:30-52 '62. (MIRA 16:6)

(Car axles—Maintenance and repair)
(Metals—Cold working)

ZOBNIN, N.P., doktor tekhn. nauk, prof.; ROGOV, A.Ya., kand. tekhn. nauk, dotsent; KHAFKO, V.U., kand. tekhn. nauk, dotsent; YUDIN, D.L., kand. tekhn. nauk, dotsent

Effect of the cold working depth on the service life of axle press joints. Trudy MIIT no.159:89-98 '62. (MIRA 16:6)

(Car axles)
(Metals—Cold working)

APPROVED FOR RELEASE: 09/17/2001 CIA-RDP86-00513R000721810002-0"

ZOBNIN, N.P., doktor tekhn.nauk, prof.; KHAPKO, V.U., kand.tekhn.nauk, dotsent

Increasing the efficiency of the cutting of gear wheels for locomotive transmissions. Trudy MIIT no.200:5-20 '64.

Mechanical hardening of gear wheels with the relieved surface of a worm cutter on the gear cutting machine. Ibid.:47-53

(MIRA 18:8)

G M KHAPLANOV

"Interchangeability of Tubes in Radio Engineering Apparatus" from Annotations of Works Completed in 1955 at the State Union Sci. Res. Inst; Min. of Radio Engineering Ind.

Sc: B-3,080,964

[illegible]

Я. И. Хургин

Стационарные импульсные [illegible] в статистической радиофизике.

11 июня

(с 18 до 22 часов)

М. С. Александров

Распределение разности фаз [illegible] флуктуирующего сигнала, шума и [illegible] шумовой помехи.

В. С. [illegible]

Некоторые теоремы конструктивной теории информации для дискретного канала с [illegible].

О. С. [illegible]

Определение вероятности ошибок [illegible].

Р. Р. Варшамов

Некоторые вопросы теории [illegible].

12 июня

(с 10 до 16 часов)

М. И. [illegible]

Системы передачи [illegible] с фазово-разностной модуляцией.

6

Н. М. [illegible]

Оптимальный прием сигналов с КИМ с [illegible].

Г. И. Руднев,
Г. М. [illegible]

Сеть как канал передачи информации.

Г. И. Руднев,
Г. М. [illegible]

О [illegible] электромагнитного поля в связи с проблемой передачи и приема информации.

А. А. [illegible]

Некоторые [illegible] преобразования «ВАЛКОД».

12 июня

(с 18 до 22 часов)

В. И. [illegible]

Групповое передача [illegible] сигналов [illegible].

Я. Я. [illegible]

Вопросы потенциальной помехоустойчивости при [illegible] сигнала.

7

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORIE), Moscow, 8-12 June. 1959

В. Л. Крейцер

Передача двух независимых телевизионных программ по общему каналу связи

12 июня

(с 10 до 16 часов)

М. И. Кривошеев

Измерение [illegible] в телевидении.

В. Л. [illegible]

О применении фазового метода синхронизации в [illegible] системах цветного телевидения.

С. Д. [illegible]

Перспективы применения фотоумножителей для регистрации малых световых потоков.

Н. Г. [illegible]

Прибор для проверки линейности телевизионного канала

12 июня

(с 18 до 22 часов)

В. В. [illegible]

Телевизионная передающая трубка суперортикон с памятью

Ч. Г. [illegible]

Телевизионные системы, использующие [illegible] трубки на передающем и приемном концах

Н. Н. [illegible]

Усилители для двухсигнальных приборов

В. В. [illegible],

М. Г. [illegible]

О геометрических искажениях растра в телевизионных передающих трубках.

7. СЕКЦИЯ ЭЛЕКТРОНИКИ

Руководитель Н. Д. Девятков

9 июня

(с 10 до 16 часов)

Г. Н. [illegible],

Г. М. [illegible]

Новые [illegible] методы в радиоэлектронике.

В. А. Афанасьев

Перспективы снижения коэффициента шума электронных приборов СВЧ

report submitted for the Centennial Meeting of the Scientific Technological Society of Radio Engineering and Electrical Communications im. A. S. Popov (VNORIE), Moscow, 8-12 June, 1959

KHAPLANOV, M. G.

O kharaktere stepennykh razlozheniy funktsiy, imeyushchikh na kruge skhodimosti odnu osobuyu tochku. Rostov N/D, Uchen. Zap. Un-Ta., 8 (1936), 92-130.

SO: Mathematics in the USSR, 1917-1947
edited by Jurosh, A. G.,
Markushevich, A. L.,
Rashevskiy, P. K.
Moscow-Leningrad, 1948

KHAPLANOV, M. G.

O koeffitsiyentakh ryada teylora odnogo klassa meromorfnykh funktsiy. DAN, 28 (1940), 679-684.

SO: Mathematics in the USSR, 1917-1947.
edited by Jurosh, A. G.,
Markushevich, A. L.
Rashevskiy, P. K.
Moscow-Leningrad, 1948

"On the Taylor Coefficients of a Class of Metomorphic Functions,"

Physico-Math. Inst., ~~Rostov State Univ~~ Rostov State Univ. im Molotov

M. L. Some properties of an analytic space
Akad. Nauk SSSR (N.S.) 79, 929-932 (1951)

The space is the set A_R ($\bar{A}_R$) of all sequences $x(x_1, x_2, \cdots)$ of complex numbers such that $f(z) = x_1 + x_2 z + \cdots$ is an analytic function of the complex variable z for $|z| < R$ ($\leq R$). In the terminology of Köthe and Toeplitz [J. Reine Angew. Math. 171, 193-226 (1934)] ... Köthe ... Rev. 12, 6 ... the ... $(A_R)^* = \bar{A}_{1/R}$, $(\bar{A}_R)^* = A_{1/R}$ so that A_R is a ... coordinate space. (1) $M \subset A_R$ is bounded if and only if the corresponding set of functions has a majorant ... a convergent sequence in the Köthe sense ... $M \subset \bar{A}_R$ is bounded if and only if ... convergent ... A_R ... Köthe ...

Mathematical Reviews, Vol. 13 No. 3

Hapla ov, M [illegible] Linear transformations [illegible] spaces. [illegible]

[illegible]

the matrix [illegible] transformation [illegible]

1951 [illegible] 252 [illegible]

[illegible] that [illegible]

[illegible] and only if [illegible]

[illegible] these [illegible]

Haplanov, M. G. A matrix ...

of analytic functions ...

60 ... 180 (1951 ...

KHAPLANOV, M. G.

Functional Analysis

Matrix sign of the completeness of a system of analytic functions. Dokl. AN SSSR 83 No. 1 1952.
Rostovsky Gosudarstvenny Universitet: Im. V. M. Molotova Rcd. 26 Oct. 1951.

SO: Monthly List of Russian Accessions, Library of Congress, August 1952, Uncl.

Mathematical Review,
June 1954
Analysis

10-7-54
LL

Rostov State U in Molotov

(1) Haplanov, M. G. On the spectral theory of matrices in an analytic space. Doklady Akad. Nauk SSSR (N.S.) 90, 969–972 (1953). (Russian)

The principal theorem states that if $f_n(x)$ is a sequence of functions analytic in $|x|<R$ with a matrix mapping the analytic space A_{R_1} into A_R, $R_1<R$ [cf. Haplanov, same Doklady (N.S.) 80, 21–24, 177–180 (1951); these Rev. 13, 470, 357], then the sequence $h_n(x)=x^n-\lambda f_n(x)$ is a quasi-power basis in $|x|<R$ for any λ which is not an eigenvalue of the integral equation

$$\varphi(x)=f(x)+\lambda\int_C K(x,s)\varphi(s)ds,$$

where $K(x,s)=(2\pi i)^{-1}\sum_{j=1}^{\infty}\overline{f_j(x)}/s^{j+1}$, and C is any circle $|x|=r<R$. Similar problems relating to fundamental systems and normal bases in analytic spaces are reduced to problems about the spectra of integral equations.

B. Crabtree (Durham, N. H.).

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KHAILANOV, M. G.

USSR/Mathematics - Matrices Eigenvalues 1 Sep 53

"Point Character of the Spectrum of a Certain Class of Matrices in Analytical Space," N. N. Rozhanskaya

DAN SSSR, Vol 92, No 1, pp 7-10

Considers an infinite matrix $M(a_{ik})$ $(i,k=1,2,\ldots)$ that transforms an analytic space A_R $(0<R<\infty)$ into itself (M. G. Khaplanov, DAN, 80, Nos 1,2 (1951)). Notes that M. G. Khaplanov was the first to study the character of the spectrum of such matrices (DAN, 90, No 6, 1953). Studies the spectrum by the method of converging sequences of matrices. Generalizes M. G. Khaplanov's conditions

274T61

for the presence of purely point spectrum (i. e. eigenvalues). Presented by Acad M. V. Keldysh 30 Jun 53.

GAKHOV, F.D.; KHAPLANOV, M.G.; AL'PER, S.Ya.

"Brief outline of mathematical analysis." A.IA.Khinchin. Reviewed by F.D.Gakhov, M.G.Khaplanov, S.IA.Al'per. Usp.mat.nauk 9 no.4: 266-275 '54. (MLRA 8:1)

(Calculus) (Khinchin, Aleksandr IAkovlevich, 1894-)

Haplanov, M. [illegible] Spectrum of [illegible] an analytic space. Rostov. Gos. Univ. Uč. Zap. Fiz.-Mat. Fak. 32 (1955), no. 4, 3–8. (Russian)

After mentioning a number of properties of the space l_1 (all functions analytic in the unit circle) and l_∞ (all functions whose power series have bounded coefficients) the author proves that any matrix M mapping l_∞ into l_1 [illegible] is a point spectrum [illegible] [illegible] inverses except [illegible] [illegible] finite limit point [illegible] theory of integral equations [illegible]

M. G. Linear differential equations of infinite order with analytic coefficients. Dokl. Akad. Nauk SSSR (N.S.) 105 (1955)

... is made ... Toeplitz ... concept ...

... of the matrix M are dependent if the homogeneous system of equations $Mc=0$ has a non-...

... theorems are stated concerning ...

HAPLANOV, A. G.

(1) and associated matrices of ... is of class I if and only if the operator matrix

$$N=\begin{pmatrix} a_{00} & a_{01} & \cdots \\ a_{10} & a_{11} & \cdots \\ \cdot & \cdot & \cdots \end{pmatrix}$$

transforms space $A_{1/e}$ into A_R. [Definition of these spaces appears in an earlier work of the author same Dokl. (N.S.) 79 (1951), 929–932; MR 13, 252.] 2. Let $L[y]$ be of class I. If $f(x) \in E_n$ then equation (1) has a solution $y \in E_e$ if and only if the vectors c, b satisfy the system $Mc=b$. (Here $M=(a_{jn}')$, where $a_{jn}'=\sum_{s=0}(1/s!)a_{j-s,n-s}$; $c=(c_0, c_1, \cdots)$, where $y(x)=\sum_0^\infty (c_n/n!)x^n$; and $b=(b_0, b, \cdots)$.) An interesting application is made to the equation $\sum_{n=0}^\infty (a_n+b_nx)y^{(n)}=f(x)$.

I. M. Sheffer.

2/2

HAPLANOV, M. G.

Haplanov, M. G. Infinite matrices in an analytic space. Uspehi Mat. Nauk (N.S.) 11 (1956), no. 5(71), 37–44. (Russian) 1-FW 3

Let A_R and $\bar{A}_R$ denote the spaces of points $a=(a_0, a_1, \cdots)$ whose coordinates satisfy the conditions

$$\limsup |a_n|^{1/n} \leq 1/R, \quad \limsup |a_n|^{1/n} < 1/R,$$

respectively. The author indicates various ways in which such spaces can be interpreted as spaces of analytic functions. He also considers the continuous linear operators T which (collectively) map an infinite-dimensional vector space E into an infinite-dimensional vector space E_1. In order that T map A_R with $R=1$ into itself, it is necessary and sufficient that (i) the columns of its matrix $M=(a_{jn})$ have a common majorant belonging to A_1 and (ii) there exist two constants q $(0<q<1)$ and m such that $|a_{jn}|<q^n$ for $n>mj$. The author classifies the matrices M with regard to linear independence of rows and of columns, and interprets the classification in terms of the mappings T. For example, if the rows of M are linearly independent, while some of the columns are dependent, then either M has infinitely many left inverses, and T maps E on all of E_1; or M has no inverses, and T maps E on a dense subset of E_1; in both cases, infinitely many points of E are carried into one point. The theory is applied to the problem of determining

[illegible]

2

KHAPLANOV, M.G.

LITVINCHUK, G.S.; KHAPLANOV, M.G.

Bases and complete systems in the space of analytic functions of two variables. Usp.mat.nauk 12 no.4:319-325 Jl-Ag '57. (MIRA 10:10)
(Functions, Analytic) (Functions of several variables)
(Matrices)

KHAPLANOV, Mikhail Grigor'yevich; ROZHANSKAYA, N.M., otv.red.; SHKORINOV, V.P., red.; PAVLICHENKO, M.I., tekhn.red.

[Theory of functions of complex variables] Teoriia funktsii kompleksnogo peremennogo; kratkii kurs. Rostov-na-Donu, Izd-vo Rostovskogo univ., 1959. 193 p. (MIRA 14:2)

(Functions of complex variables)

KHAPLANOV, M. G., Doc Phys-Math Sci -- (diss) "Linear operators in analytic space and their application." Khar'kov, 1960. 11 pp, (Ministry of Higher and Secondary Specialist Education, Ukrainian SSR, Khar'kov Order of Labor, Red Banner State Univ im A. M. Gor'kiy), 200 copies, free, bibliography at end of text (20 entries), (KL, 17-60, 138)

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16.1600

AUTHOR: Khaplanov, M.G.

TITLE: Linear Operators in an Analytic Space

PERIODICAL: Referativnyy zhurnal. Matematika, 1960, No.9, pp.57-58, Abstract No.10209. Uch.zap.Fiz-matem.fak. Rostovsk. un-t, 1959, Vol.43, No.6, pp.83-118

TEXT: The author considers spaces A_R $(\bar{A}_R)$, $0 \leq R \leq \infty$, of all sequences $x(x_0, x_1, \dots)$ the coordinates of which satisfy the condition $\overline{\lim\limits_{n \to \infty}} \sqrt[n]{|x_n|} \leq \frac{1}{R}$ $(\overline{\lim\limits_{n \to \infty}} \sqrt[n]{|x_n|} < \frac{1}{R}$, $R < \infty)$. The topology in these spaces is introduced according to the method of Köthe and Toeplitz (Köthe,G., Toeplitz, O., J.reine und angew.Math. 1934, Vol.171, pp.193-226). In several ways the spaces A_R and $\bar{A}_R$ can be realised as spaces of analytic functions in certain regions of the complex plane. If especially the function $x(z) = \sum\limits_{i=0}^{\infty} x_i z^i$ is adjoint to the sequence $x(x_0, x_1, \dots)$ then A_R $(\bar{A}_R)$ becomes the space of analytic functions in the open (closed) circle $|z| < R$ $(|z| \leq R)$,

Card 1/3

89036
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C111/C222

Linear Operators in an Analytic Space

and here the introduced topology is identical with the topology generally usual in these spaces. The first chapter of the paper contains the description of such topological notions in the A_R ($\bar{A}_R$) as the convergence of the sequences, simple and strengthened boundedness of the subsets, and compactness. The second chapter treats the description of linear non-limit-operators which map an analytic space into another. Basic results: Theorem 1: In order that a matrix $[a_{ik}]$ transforms an (arbitrary) analytic space A into A_{R_1}, $R_2 \neq 0$, it is necessary and sufficient that for every $r < R_1$ the inequality $|a_{jn}| r^j \leq c_n$ is satisfied, where j,n=0,1,..., and the point $c(c_0, c_1, \ldots)$ belongs to the dual space A^*.

Theorem 2: In order that the matrix $[a_{ik}]$ transforms the space $\bar{A}_R$ into A it is necessary and sufficient that for all j,n and $r < 1/R$ the inequality $|a_{jn}| r^n \leq c_j$ is satisfied, where the point $c(c_0, c_1, \ldots)$ belongs to the

Card 2/3

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89036
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C111/C222

Linear Operators in an Analytic Space

space A.
Furthermore the matrix is described which represents a linear continuous operator from the Banach space l_p, $1 < p \leq \infty$, into the analytic space A_1. X
The given results and some of the proofs are published by the author in earlier papers (Doklady Akademii nauk USSR, 1951, Vol.79, No.6, and Vol.80, No.1,2).

[Abstracter's note: The above text is a full translation of the original Soviet abstract.]

Card 3/3

KHAPLANOV, M.G.

Linear functionals in a space of single-valued analytic functions. Trudy Sem. po funk. anal. no.3/4:115-121 '60. (MIRA 14:10)

(Functions, Analytic)

VOROVICH, I.I.; KHAPLANOV, M.G.

Work of Rostov mathematicians in recent years. Usp. mat. nauk 18 no.2:211-233 Mr-Ap '63. (MIRA 16:8)

(Rostov--Mathematics)

RUKHMAN, L.Ye.; RAYEVSKAYA, T.P.; KHAPMAN, V.L.

Insertion appliances of polyethylene in foot defects. Ortop., travm. i protez. no.1:77-80'63. (MIRA 16:10)

1. Iz detskoy kliniki (zav. - doktor med. nauk L.Ye. Rukhman) Leningradskogo instituta protezirovaniya (dir. - dotsent M.V. Strukov).

KHAPOV, V.S.; KORYAYEVA, A.I.; TEMNOV, Yu.A.

Improving the quality of stuffing box packings. Avt. i trakt. prom. no.12:34-36 D '57. (MIRA 11:1)

1. Yaroslavskiy avtozavod.
(Packing (Mechanical engineering))

SOV/113-59-5-9/21

12(2)

AUTHORS: Zaytsev, K.S.; Khapov, V.S.

TITLE: Experience in Testing Automobile Transmissions on Test Stands

PERIODICAL: Avtomobil'naya promyshlennost', 1959, Nr 5, pp 24-25 (USSR)

ABSTRACT: The authors describe briefly three types of test stands used for investigating the functioning of automobile transmissions at the Yaroslavl'Engine Plant. A torsion test stand for determining the static strength of assembled transmission components is shown by photograph, Figure 1. A test stand for wear and fatigue tests of transmissions is shown by photograph, Figure 2. With this device two transmissions may be tested simultaneously, while a third one serves as a reductor. A test stand for transmission gear shift mechanisms is shown by photograph, Figure 3. Gear shifting is performed automatically by a pneumatic device at

Card 1/2

SOV/113-59-5-9/21

Experience in Testing Automobile Transmissions on Test Stands

a rate of six shifts per minute. As an example for a more complete utilization of these test stands, the authors mention the investigation of transmissions, containing parts made of different types of steel 12KhNZA, 18KhGT, 30KhGT and 15KhGNTA, whereby the best results were obtained with the latter steel. However, the proper temperature conditions must be selected when hardening parts made of steel 15 KhGNTA. It is possible to use steel-steel sliding friction bearings in YaMZ transmission, in case one of the bearing parts is parkerized. Steel and cast iron are not suitable for manufacturing tapered synchronizer rings since they have too high a wear and disturb the normal work of synchronizers . Further, the selection of the proper lubricant is of importance. There are 3 photographs.

ASSOCIATION: Yaroslavskiy motornyy zavod (Yaroslavl' Engine Plant)

Card 2/2

Khaprov, Ye. N.

AUTHORS: Dmitriyev, P.P., Krasnov, N.N., Khaprov, Ye.N. 89-7-9/32

TITLE: On the Problem of the Deflection of a Bundle in a Cyclotron (K voprosu ob otklonenii puchka v tsiklotrone)

PERIODICAL: Atomnaya Energiya, 1957, Vol. 3, Nr 7, pp. 45-47 (USSR)

ABSTRACT: At first some previous works dealing with this subject are discussed. The experiments for the production of a deflected bundle were carried out by means of a meter cyclotron. According to computation a deuteron energy of 10.6 MeV corresponds to the output radius of 44 cm. The magnetic field here decreases by 2.2% and the coefficient for the decrease of the magnetic field amounts to n = 0.2. A schematical section through the chamber of the cyclotron is shown by a schematical drawing. An ion source with covered-up arcs was used on the occasion of these experiments. The shifting of the source and the control of its location takes place by remote control without switching off of the cyclotron. The high voltage is transferred into the duants in form of pulses with a frequency of 200 pulses per sec. The voltage amplitude between the duants amounts to from 90 to 100 kV. The current intensity of the inner bundle amounts to from 800 to 100 micro-

Card 1/2

ampères within the pulse. The current intensity of the deflected bundle can be registered on three places by means of the targets M1, M2, and M3. Measuring takes place simultaneously by means of a thermal and an electric method. The first experiments were carried out by means of the usual deflector with plane electrodes. With the shifting of the ion source a sharp maximum in the current intensity of the deflected bundle is observed. With the modification of the amplitude of the voltages between the duants a new location of the source had to be chosen for the purpose of obtaining the maximum current intensity. (Numerical data are given). It was possible to increase the current intensity of the deflected bundle (on the target M1) up to from 45-50% of the current intensity of the interior bundle. Next, a deflecting system with hyperbolic electrodes was investigated. The current intensities registered on all three exterior targets were equal to one another, which signifies a shortening of the horizontal dimensions of the bundle. There are 3 figures and 6 references, 4 of which are Slavic.

SUBMITTED: February 8, 1957

AVAILABLE: Library of Congress

Card 2/2

1. Ion bundles - Deflection - Test results 2. Cyclotrons - Operation

KHAPROV, Ye.N.

PHASE I BOOK EXPLOITATION SOV/1297

Vsesoyuznaya nauchno-tekhnicheskaya konferentsiya po primeneniyu radioaktivnykh i stabil'nykh izotopov i izlucheniy v narodnom khozyaystve i nauke, Moscow, 1957

Polucheniye izotopov. Moshchnyye gamma-ustanovki. Radiometriya i dozimetriya; trudy konferentsii... (Isotope Production. High-energy Gamma-Radiation Facilities. Radiometry and Dosimetry; Transactions of the All-Union Conference on the Use of Radioactive and Stable Isotopes and Radiation in the National Economy and Science) Moscow, Izd-vo AN SSSR, 1958. 293 p. 5,000 copies printed.

Sponsoring Agency: Akademiya nauk SSSR; Glavnoye upravleniye po ispol'zovaniyu atomnoy energii SSSR.

Editorial Board: Frolov, Yu.S. (Resp. Ed.), Zhavoronkov, N.M. (Deputy Resp. Ed.), Aglintsev, K.K., Alekseyev, B.A., Bochkarev, V.V., Leshchinskiy, N.I., Malkov, T.P., Sinitsyn, V.I., and Popova, G.L. (Secretary); Tech. Ed.: Novichkov, N.D.

PURPOSE: This collection is published for scientists, technologists, persons engaged in medicine or medical research, and others concerned with the production and/or use of radioactive and stable isotopes and radiation.

COVERAGE: Thirty-eight reports are included in this collection under three main subject divisions: 1) production of isotopes 2) high-energy gamma-radiation facilities, and 3) radiometry and dosimetry.

TABLE OF CONTENTS:

PART I. PRODUCTION OF ISOTOPES

Card 2/12

Card 3/12

KHAPROV, YE. N.

21(8)

AUTHORS: Guldamashvili, A. I., Dmitriyev, P. P. SOV/89-5-6-18/25
Krasnov, N. N., Mishin, V. Ya.,
Khaprov, Ye. N.

TITLE: The Production of the Isotope As^{74} by Means of a Cyclotron (Polucheniye izotopa As^{74} na tsiklotrone)

PERIODICAL: Atomnaya energiya, 1958, Vol 5, Nr 6, pp 660 - 661 (USSR)

ABSTRACT: As^{74} was obtained by the irradiation of metallic germanium with the external 10,8 MeV deuteron beam of the cyclotron (Ref 5).
The characteristic feature of the target was the fact that the cooling water immediately reached the inner surface of the irradiated germanium plate. The germanium plate was cast in a vacuum and was then ground to the dimensions 170.40.4 mm^3.
The deuteron beam (60-70 μA) is limited by a shutter so that only a surface of 150.25 mm^2 of the germanium was irradiated.
The water consumption was 5 l/m.
Chemical separation was carried out as follows: After the irradiated sample had been boiled twice (for 15 to 20 minutes) in aqua regis, about 97-98 % of the activity had dissolved.

Card 1/3

The solution was steamed-in and extracted with 11 n HCl (method according to reference 6). The arsenic carrier used weighed 50 μg. Concentration of the arsenic isotope was carried out by the Marsh method (arsenic hydride). The two preparations, which were enclosed in an ampoule of 0,6 cm^3, had an initial activity of 60 mC. The As^{74} activity was measured by comparison with a Co^{60} source by means of the micro-roentgenometer of the type "Kaktus" 30 days after irradiation. The total yield obtained by the formation of As^{74} was: 25 $\mu C/\mu A.h \pm$ 15 %. The half time was: $T_{1/2}$= 18,4±0,4 d. Professor B. S. Dzhelepov, I. P. Selinov, and Ye. Ye. Baroni interested themselves in this work. M. Z. Maksimov calculated the yield curve. Yu. A. Bliodze and I. I. Zhivotovskiy assisted in carrying out experiments. There are 2 figures and 10 references, 3 of which are Soviet.

KHARA, I. S.

Hara, I. S. On a method of approximate conformal mapping of a many cornered region onto the unit circle. Dopovidi Akad. Nauk Ukrain. RSR 1953, 28?–293. (Ukrainian. Russian summary)

A numerical method for approximating the constants which occur in the application of the Christoffel-Schwartz method for the conformal representation of polygonal regions is given with examples. C. Salzer.

Khar'kov Polytech. Inst. im. V. I. Lenin

KHARA, I.S.; SAVIN, G.M., diisnyi chlen Akademiyi nauk URSR.

Investigation of stress concentration during dilation in infinite plates weakened by arched or trapezoid apertures. Dop.AN URSR no.4:294-298 '53. (MLRA 6:8)

1. Kharkivs'kyi politekhnichnyi instytut imeni V.I.Lenina. 2. Akademiya nauk URSR (for Savin). (Elastic plates and shells)

KHARA, I.S.; SAVIN, G.M., diisnyi chlen Akademiyi nauk URSR.

Investigation of stress concentration in thick plates beside arched and trapezoid apertures supported by absolutely rigid rings. Dop.AN URSR no.4: 299-303 '53. (MLRA 6:8)

1. Kharkivs'kyi politekhnichnyi instytut imeni V.I.Lenina. 2. Akademiya nauk URSR (for Savin). (Elastic plates and shells)

16(1)

AUTHOR: Khara, I.S. SOV/20-126-6-15/67

TITLE: Some Approximate Formulas in the Theory of Conformal Mappings

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 6, pp 1210-1213 (USSR)

ABSTRACT: The conformal mapping of the unit circle $|z| < 1$ onto an arbitrary closed polygon of the ζ -plane is carried out by the Christoffel - Schwarz integral as is well-known. For three classes of polygons (which differ strongly from the circle) the author gives approximative formulas in which the sides of the polygons are explicitly expressed by the Christoffel-Schwarz constants. Let the polygon be e.g. a rectangle with the angles A_1, A_2, A_3, A_4, where the point $\zeta = 1$ is assumed to lie in the center of A_1A_2. Let the constants $-\varphi, \varphi, \pi - \varphi, \pi + \varphi$ correspond to the angles. If it is $\overline{A_2A_3} : \overline{A_1A_2} = \lambda \gg 1$ (extended rectangle), then it holds

Card 1/2

Some Approximate Formulas in the Theory of Conformal Mappings SOV/20-126-6-15/67

approximately $A_1A_2 = \frac{\pi}{2}$, $A_2A_3 = \ln\frac{4}{\varphi}$, $\varphi = 4e^{-\frac{\pi\lambda}{2}}$.

The author gives similar formulas in the two other more complicated cases. Since the lateral lengths are expressed by integrals of the type $\int\limits_{\varphi_{k-1}}^{\varphi_k} |f(\zeta)|\,|d\zeta|$, the approximation formulas are obtained by approximative calculation of these integrals.
There are 3 figures.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut imeni V.I. Lenina (Khar'kov Polytechnical Institute imeni V.I. Lenin)

PRESENTED: March 12, 1959, by S.L. Sobolev, Academician
SUBMITTED: March 9, 1959

Card 2/2

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AUTHOR: Khara, I. S.

TITLE: A numerical method of solving eigenvalue problems

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 3, 1961, 574 - 577

TEXT: Let s in the characteristic equation

$$1 + a_1\lambda + a_2\lambda^2 + \ldots + a_s\lambda^s = 0 \qquad (1)$$

of a one-dimensional boundary value problem be such that the first s_0 eigenvalues can be determined with an error not higher than some per cents. In the determination of the eigenvalues of the boundary value problems for

$$q_1(x)y'(x) + q_2(x)y''(x) + \ldots + q_n(x)y^{(n)}(x) = \lambda r(x)y(x) \qquad (2)$$

where the coefficients are smooth, the homogeneous system of equations for $y_k^{(i)} = y^{(i)}(\frac{k-1}{s})$ $(k = 1, 2, \ldots, s + 1)$ be obtained by multiple integration. The following integrals are obtained:

Card 1/4

X

30718
S/020/61/141/003/005/021
C111/C444

A numerical method of soving...

$$\int_{x_\omega}^{x_\omega+k} \int_{x_\omega}^{x} \dots \int_{x_\omega}^{x} r(x)y(x)dx^\nu \qquad (3)$$

In order to replace those by finite sums, the following formulas

$$\int_0^{x_k}\int_0^{x}\dots\int_0^{x} \varphi(x)\psi(x)\,dx^\nu = b^\nu \sum_{l=1}^{m} A_{kl}^{(\nu,m)}[\varphi]\,\psi(x_l) + R_k^{(\nu,m)}; \qquad (4)$$

$$\int_0^{x_k}\int_0^{x}\dots\int_0^{x} \psi(x)\,dx^\nu = \frac{b}{(\nu-1)!}\sum_{l=1}^{m} A_{k,l}^{(1,m)}[1](x_k-x_l)^{\nu-1}\psi(x_l) + \overline{R}_k^{(\nu,m)}; \qquad (5)$$

$$A_{kl}^{(\nu,m)}[\varphi] = \sum_{j=1}^{p} B_{k,l,j}^{(\nu,m,p)}\varphi(x_j), \quad x_j = \frac{j-1}{p-1}b, \quad x_l = \frac{l-1}{m-1}b, \qquad (6)$$

$$B_{k,l,j}^{(\nu,m,p)} = b^{-\nu}\int_0^{x_k}\int_0^{x}\dots\int_0^{x} l_j^{(p)}(x)\,l_l^{(m)}(x)\,dx^\nu, \quad k = 2,3,\dots,m,$$

are introduced, where $l_j^{(p)}(x)$ and $l_i^{(m)}(x)$ are the coefficients of the Lagrange polynomial for the knots x_j and x_i. The special case

Card 2/4

X

S/020/61/141/003/005/021
C111/C444

A numerical method of solving...

of (4) for $\varphi(x) = 1$ is indicated with (4a). After a comparison of the formulas (4), (5), (4a) it is recommended:

If $r(x) = x^{\gamma}$ ($\gamma = 0, 1, 2$), then in (4) $\varphi(x) = x^{\gamma}$, $\psi(x) = y(x)$ is substituted, and the integrals (3) are calculated by aid of the coefficients $A_{k,i}^{(\nu,m)}[x^{\gamma}]$. But if $r(x) \neq x^{\gamma}$ is slowly variable, then (3) is calculated according to the formula (4a) with $\psi(x) = r(x)y(x)$. If $r(x) \neq x^{\gamma}$, being sufficiently quick variable, then (4) is used, where $r(x) = \varphi(x)$, $\psi(x) = y(x)$ and $A_{k,i}^{(\nu,m)}[\varphi]$ are determined out of (6) with $\varphi(x) = r(x)$.

For (2) with $n = 2$ the boundary conditions $y'(0) = y(1) = 0$ be given and (1) shall be constructed for a sufficiently large s. (2) is twice integrated from x_k to x, the integrals are replaced for $x = x_{k+1}$ and $x = x_{k+2}$ by finite sums according to (4), and two equations are are obtained; after elimination of y'_k the following relation is obtained:

Card 3/4

30718

S/020/61/141/003/005/021
C111/C444

A numerical method of solving...

$$y_{k+2}D^{(2)}_{k+2} = y_{k+1}D^{(1)}_{k+1} + y_kD^{(0)}_k. \quad (7)$$

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(7) is completed by one of the two mentioned equations with k = 1, and s homogeneous equations with s unknown quantities. By means of three examples it is shown that the recommended method is partly far more exact than e. g. the ordinary difference method.
At last one considers shortly the bending oscillations of bars which are loaded by single forces.

There are 3 Soviet-bloc and 1 non-Soviet-bloc references.

ASSOCIATION: Khar'kovskiy politekhnicheskiy institut im V. I. Lenina (Khar'kov Polytechnical Institute im. V.I. Lenin)

PRESENTED: July 1, 1961, by I. G. Petrovskiy, Academician

SUBMITTED: June 28, 1961

Card 4/4

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16.4500

AUTHOR: Khara, I.S.

TITLE: A method for the construction of Hermite's interpolation formula and quadrature formulas for solving boundary value problems and integral equations

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 4, 1961, 822-825

TEXT: At first it is shown that the Hermitean formula with multiple knots can be obtained by a limiting passage from the interpolation formula of Lagrange

$$f(x) = \sum_{k=1}^{n} l_k^{(n)}(x) f(x_k) + R(x) = \sum_{k=1}^{n} L_k^{(n)}(x) + R(x) \qquad (1)$$

by putting $\left[\prod_{k=1}^{n} (x-x_k)\right] : \left[(x-x_i)\ (x-x_{i+1})\right] = \omega_i(x)$; $x_{i+1} = x_i + h$

and letting $h \to 0$.

Then the Hermitean formula is written for the interval $[-b, b]$:

Card 1/4

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